

58. The process according to claim 54, furthermore comprising drying of the washed particles by spray-drying.

59. The process according to claim 53, furthermore comprising the step of chemical or enzymatic modification of the washed particles.--

### REMARKS

The specification has been amended to correct minor clerical errors. No new matter has been entered. Pursuant to 37 CFR 1.121, a marked copy of the amended specification paragraphs showing the changes made therein accompanies this Amendment.

The claims have been rewritten to better define the claimed invention and better distinguish the claimed invention from the prior art. More particularly, the new claims 30-59 are all directed specifically to the composition comprising a fractionated chicory inulin, and a process for forming same. Moreover, all of the claims recite specific features regarding particle size and crystal form of the crystallized fractionated inulin that make the product and process unique and non-obvious as discussed below. For the convenience of the Examiner, a table showing the relationship and support for the new claims is attached hereto as Appendix A.

The indicated allowability of original claims 13, 14 and 27 is noted, with thanks. However, in view of the above amendments and following comments, it is believed that all of the new claims 30-59 are allowable over the art.

Before considering the art rejection specifically, Applicants point out that native chicory inulin is known to have an average degree of polymerisation (av. DP) of about 10 (see e.g., page 5 of L. Boeckner et al., Adv. Food Nutr. Res., 43, 1-63, (2001); excerpt p.2-6 - copy follows under separate letter), and that, as defined in new claim 30, the crystallized fractionated

polydisperse chicory inulin according to the invention has an av. DP that is double or higher than the av. DP of the native chicory inulin (see e.g. p.12, lines 10-16 + p. 13, lines 27-31, and Example 3, p.37, lines 4-12).

Turning specifically to the rejection of the now cancelled claims over Kunz et al. (U.S. Patent No. 5,478,732), Applicants note that the only disclosure regarding crystallized inulin is found in Example 5 (Column 6, lines 1-16). In this example, an aqueous solution of crude chicory inulin at 80°C has been cooled slowly to 50°C, during which process some of the inulin precipitated in solid form with a mean particle size of 20 micrometer. The isolated precipitate was washed with water at 50°C and then dried, yielding crystallized inulin with a mean chain length (= av. DP) of 12. The av. DP of this crystallized inulin is clearly far below the double of the av. DP of the native inulin.

Kunz et al. (U.S. '732) discloses in Examples 8 and 9, (Columns 6 and 7) fractionated chicory inulin with an av. DP ranging from 25 to 40. In Example 8, the long-chain inulin was separated from the solution resulting from an enzymatic treatment of crude chicory inulin, by chromatography, and the fraction containing the long-chain inulin was evaporated to dryness. In Example 9, the long-chain inulin was separated from the suspension resulting from an enzymatic treatment of crude chicory inulin, by ultra-filtration using a membrane with a cut-off of 500 daltons, and the retentate which contains the long-chain inulin was evaporated to dryness.

Clearly, none of the long-chain inulin products disclosed in Example 8 or Example 9, is a crystallized long-chain inulin in the form of spherical particles that have a diameter comprised

between 1 and 100 micrometer. Furthermore, U.S. '732 is silent about the purity of the inulin products obtained in Example 8 and Example 9.

From the above it is clear that U.S. '732 does not disclose at all a crystallized fractionated polydisperse chicory inulin composition having all the features of the presently claimed inulin composition according to the subject invention. Accordingly, the crystallized fractionated chicory inulin composition according to new claim 30 as well as said inulin composition obtained by the process claimed in new claim 45 have to be considered novel.

Furthermore, the problem underlying the present invention is not merely to provide a long-chain inulin, since, as indicated in the description p.3, line 9 to p.4, line 35, various such products and methods for preparing same, are known, but rather is to provide a long-chain inulin of high purity and in a form (of crystalline particles) that enables the manufacture of said inulin by a non-tedious method at large scale in a technologically and economically attractive manner. A solution to this problem is clearly provided by the crystallized fractionated chicory inulin composition according to the present invention and by the method for the manufacture of same involving a directed crystallization according to particular process parameters.

In spite of the prior art teaching that long-chain inulin with a low content of monomeric, dimeric and oligomeric saccharides provides certain technical advantages over standard grade chicory inulin, as indicated in U.S. '732, col. 1, lines 33-47, said prior art is only pointing to certain features of the product of the present invention, namely the long-chain inulin of high purity that presents certain technical advantages. However, U.S. '732 is silent about another crucial feature of the product of the present invention, namely the particular form of the fractionated inulin particles. Applicants emphasize that it is this particular form of the solid

particles that makes it possible to obtain the desired fractionated long-chain inulin with the desired high av. DP and high purity by a directed crystallization process in a technically and economically attractive process, and that endows the crystallized fractionated inulin with additional beneficial properties as indicated below.

In spite of a long-felt need for a long-chain inulin of high purity, the problem of providing such product was not satisfactorily solved prior to the filing of the subject Application. Indeed, the solutions provided to the problem by the prior art all presented one or more disadvantages, including low av. DP of the fractionated inulin and/or complicated manufacturing processes (such as e.g. the process of U.S. '732 that requires a preliminary enzymatic treatment of the crude inulin, followed by a technically difficult or complicated separation of the desired inulin fraction from undesirable side products).

The present invention provides a solution to the long-felt need and heretofore existing technical problem by the provision of the crystallized fractionated inulin composition defined in claim 30 which is clearly non-obvious for the skilled person in view of the prior art, particularly U.S. '732. Indeed, as a result of the particular form of the crystalline particulates, namely the spherical form with a diameter from 1 to 100 micrometer, the fractionated inulin easily separates during the crystallization step from the mother liquor by precipitation, the crystalline precipitate does not include significant amounts of undesirable impurities and side products such as ash and monomeric, dimeric and oligomeric saccharides, and the precipitate can be easily and efficiently separated from the mother liquor by conventional techniques, in particular by filtration on a band filter (description, p.36, line 29-34). Besides, the particular form of the crystalline particulates enables easily and effectively washing of the filter cake with water and

thus the removal of most of the undesired impurities and side products that are adhering to the crystalline particles via an adhering film of the mother liquor, to provide the desired fractionated long-chain inulin of high purity.

Particular advantages of the spherical form and diameter of the crystallized fractionated inulin particles according to the invention compared to other particulate forms are indicated in the description (e.g. p. 14, lines 11-36; p. 15, lines 14-21; p. 19, line 10 to p. 20, line 17; p. 22, lines 28-32; p.23, lines 7-32, and comparative examples 1 to 3 on p. 35-37).

The prior art clearly does not teach or lead to a fractionated inulin of high av. DP, of high purity and of said particular form of crystalline particles according to the present claimed invention. Indeed, the closest prior art, Example 5 of U.S. '732, teaches away from a fractionated chicory inulin of high av. DP manufactured by crystallization because the fractionated product disclosed in Example 5 has an av. DP (12) that presents only a minor increase compared to the av. DP (about 10) of native chicory inulin, said fractionated inulin was obtained in a small yield (22% based on crude inulin), and the particles obtained by the disclosed crystallization could not be isolated by any technique but had to be isolated in a decanting centrifuge.

Accordingly, the crystallized fractionated chicory inulin composition according to the present invention is clearly novel and non-obvious in view of the closest prior art, particularly U.S. '732.

Besides, further properties of the composition of the invention that render it non-obvious include a higher resistance to degradation (degradation by enzymes, by acids, by bacteria and yeasts) and an improved thermal stability (see e.g. description p.13, lines 2 and 7-10; p. 15,

lines 1-3; p. 26, lines 26-27; p. 34, lines 16-26; p. 41, example 11, p.62, example 36 at p.62, line 1 to p.64, line 18). These properties further support the non-obvious character of the crystallized fractionated inulin composition according to the invention.

With respect to the manufacturing process according to the invention defined in claim 45, similar comments in support of non-obviousness apply. Indeed, there is no disclosure or teaching in the prior art that leads or motivates the skilled person to apply the process of directed crystallization of an aqueous inulin solution, involving a rapid achievement of a high degree of super-saturation and a rapid cooling down and/or rapid concentration increase through evaporation, in order to obtain crystallized particles that are spherical with a diameter between 1 and 100 micrometer that are easy to isolate by conventional techniques, particularly filtration, and that can easily be washed with water, in order to obtain a fractionated inulin with a high av. DP that is of high purity (see, e.g., description, p. 19, line 10 to p. 20, line 17; p. 21, line 10 to p.22, line 6; p. 22, line 19 to p. 23, line 32). Said resulting product from the directed crystallization, including its particular features and properties could not be expected by the skilled person on the basis of the prior art disclosures and teaching.

Accordingly, also the method for the manufacture of the crystallized fractionated chicory inulin composition according to the present invention, defined in claim 45, is novel and non-obvious in view of the prior art, in particular in view of U.S. '732.

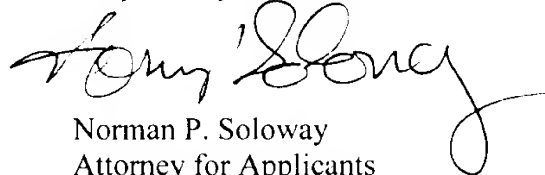
The double patenting rejection under 35 USC § 101 and the non-statutory double patenting rejection are believed rendered moot by the amendment to the claims. However, should the Examiner maintain a non-statutory double patenting rejection, Applicants will file a terminal disclaimer.

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Having dealt with all the objections raised by the Examiner, the Application is believed to be in order for allowance.

A credit card payment Form PTO-2038 authorizing a charge of \$18.00 in payment of the added claim, accompanies this Amendment. In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391.

Respectfully submitted,

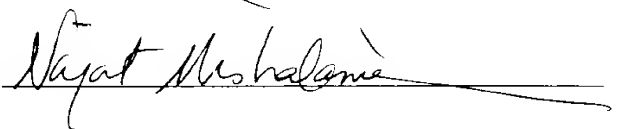


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MARKED AMENDED  
SPECIFICATION PARAGRAPHS

Serial No. 09/943,574  
Docket No.: MALDRAFF 16 CON2





Serial No. 09/943,574

Docket No. Mald Raff 16 CON2

Marked Amended Specification Paragraphs - Amendment A

**MARKED AMENDED SPECIFICATION PARAGRAPHS:**

**Paragraph beginning at page 18, line 11:**

When an inulin solution is kept at a high temperature for too long the chances of chemical breakdown, colour forming, [hydrolosys] hydrolysis and the formation of molecules with a low DP become greater. These problems are a function of the pH. In order to avoid them it is recommended that the inulin should be processed as quickly as possible at a pH of between 5 and 7.

**Paragraph beginning at page 37, line 16:**

Delta inulin is prepared according to the process described in example 3 starting with a raw carbonated inulin extract from chicory roots. Fig. 16 shows the reduction in [ashcontent] ash content and monosaccharides, disaccharides and trisaccharides in the filter cake after washing.